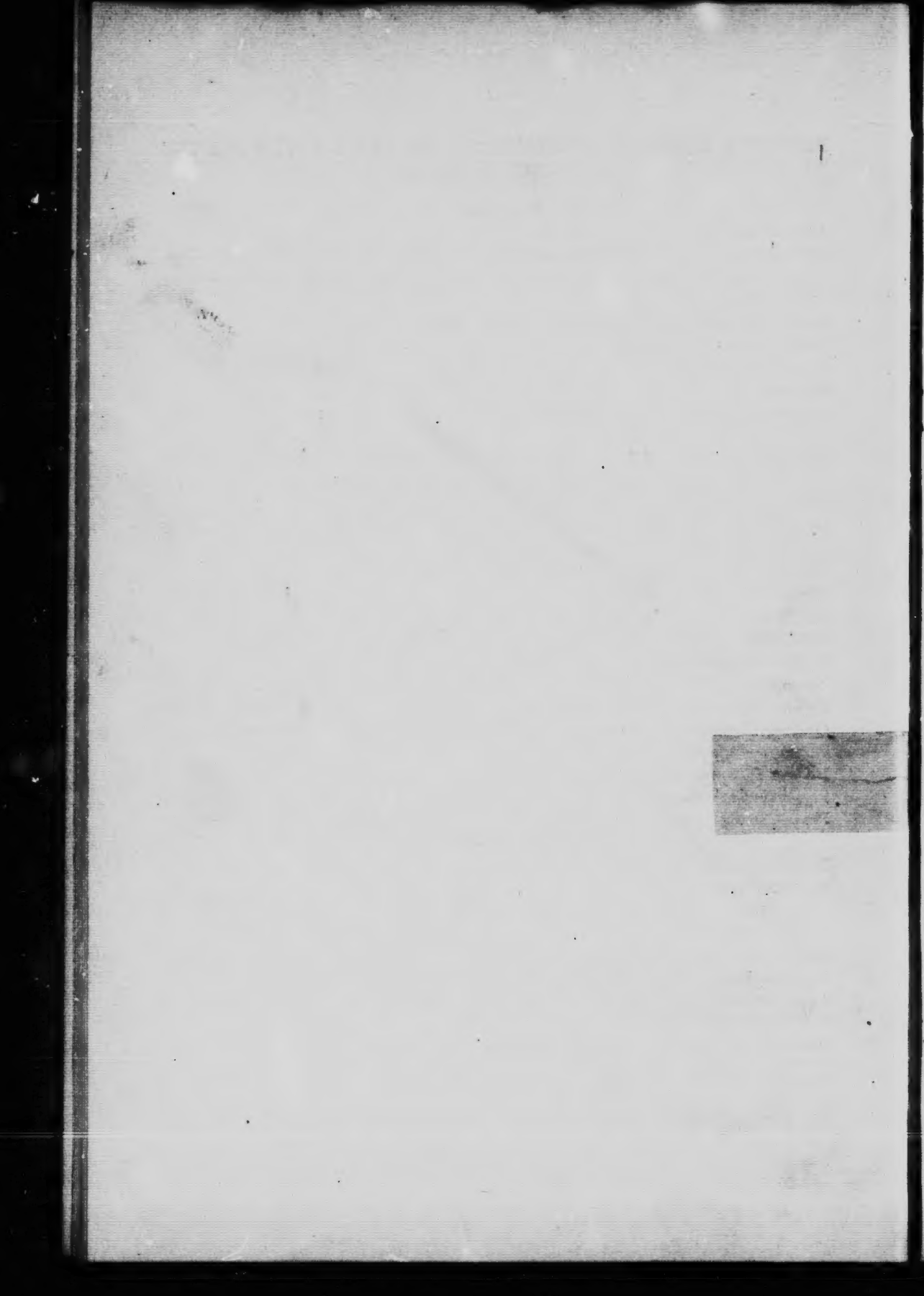




GROWING ROOTS

A PAPER

READ BY

JOHN FIXTER

Macdonald College, P.Q.

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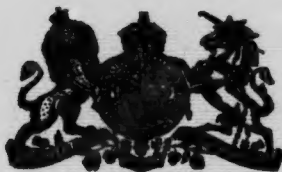
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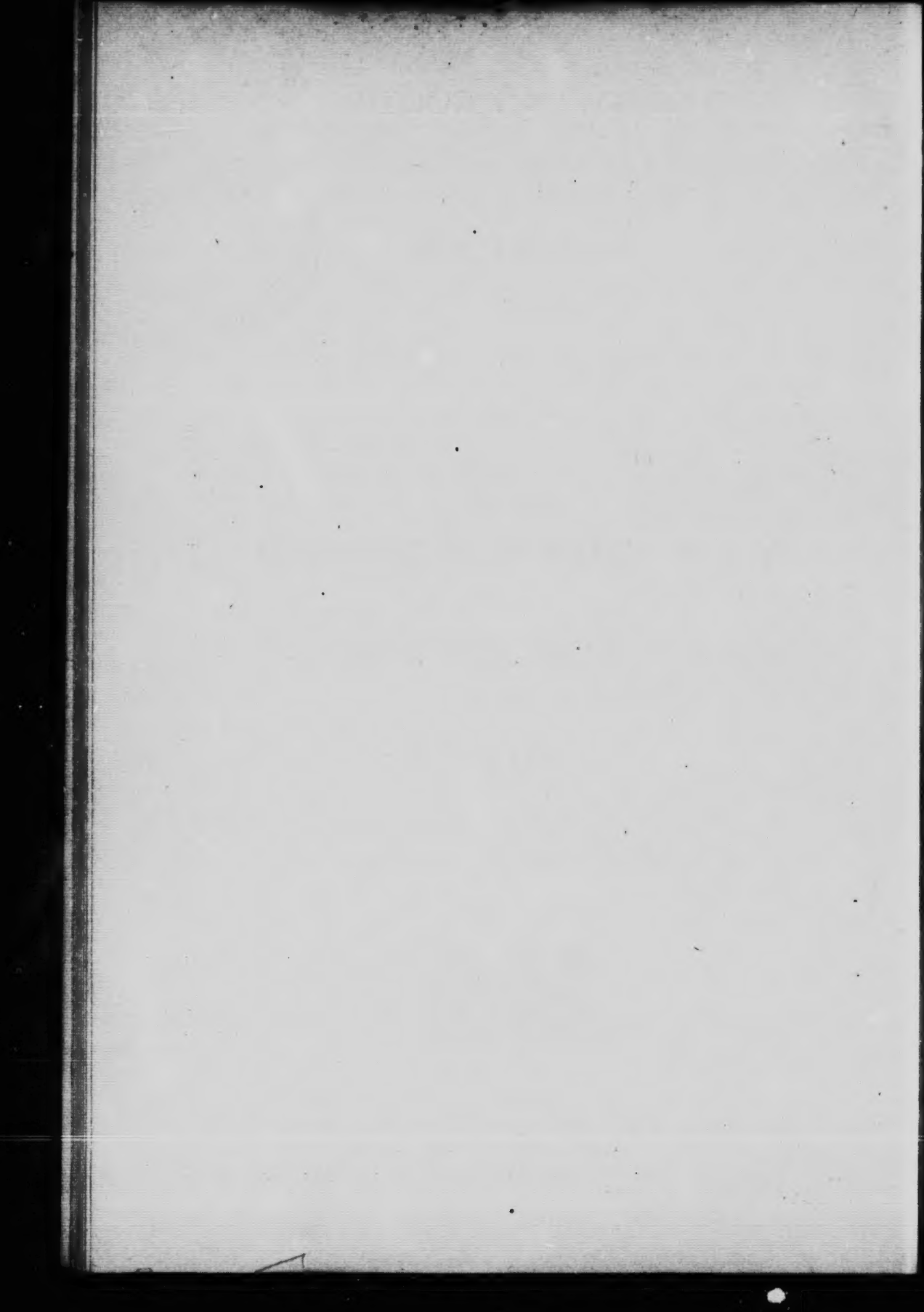
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GROWING ROOTS

BY

John Fixter,

Macdonald College, P.Q.

The importance of the root crop, for the economical feeding of all kinds of live stock, is long known on the experimental stage. Dairymen and beef producers find that when roots are fed, their animals keep in better condition, and the flow of milk and the production of flesh are increased with lessened cost. Poultry-keepers and hog-raisers also find that when the animals are fed no grass, roots are the best and cheapest substitute. There is nothing fed to animals that is more relished. Roots appear to act as a tonic and help to make all other dry feed palatable. There is about 90 per cent. of water in roots, but this water seems to have a most beneficial effect upon the digestion of the animals. The feeding of roots will enable the feeder to diminish the quantity of meal in the ration, and thus lessen the cost of production, as meal is much more expensive. Eight pounds of roots are equivalent to one pound of meal. Roots have a corrective effect upon all animals which are being forced, especially with cows that are producing large quantities of milk, and with steers that are putting on large quantities of flesh.

Roots may be successfully grown throughout Canada. The Dominion census statistics report an acreage of 236,622 acres with an average yield of 402.36 bushels per acre, valued at \$21,444,000. On the Macdonald College farm the average yield was 1,009 bushels, the highest yield being 1,150 bushels per acre. If the crop of the Dominion had been equal to the one grown on the College farm, the value would have been \$53,823,000. This is more than double the amount of the Dominion yield, and yet does not reach the limit of production. Farmers might with profit devote larger acreage to the growing of roots.

Soil.

Roots will grow on all soils that contain a reasonable amount of plant food and where the water does not come too near the surface. Should the field chosen have different kinds of soil, select the light soil for carrots, the medium for mangels and the heavy for turnips. Mangels, or sugar mangels, usually give good crops on peaty soil when a light coating of barnyard manure has been applied.

Place in the Rotation.

Mangels, carrots, turnips, and sugar mangels do best when sown on an overturned clover sod. If possible select a field that has had but one season's hay crop taken off.

The roots will then have the benefit of the fertilizing elements of the clover roots which, in one acre of the average clover sod, should be equal to the amount of nitrogen, phosphoric acid and potash contained in 12 to 15 tons of barnyard manure.

Preparation of the Soil.

Previous summer, or after-harvest cultivation is advised. Immediately after removing the hay crop plough very shallow, roll, disc harrow, and harrow sufficiently to make a fine surface and keep down all plant growth until autumn. This can be accomplished by keeping the cultivator going at intervals on very warm sunny days; each time going over the field set the cultivator a little deeper, so that the last cultivation will be at least 8 to 10 inches deep. If manure is then applied, rib up the land in ribs 2 feet apart, and leave until spring. If no manure is applied the land may either be ribbed or thoroughly ploughed, and well set up to permit the action of the winter frost.

Another and more profitable way of preparing the soil is as follows: After the hay crop is removed, plough the land 4 to 5 inches deep, roll with a heavy land roller a sufficient number of times to thoroughly pack the soil. Next disc harrow, and harrow thoroughly; then sow the field with rape, or white turnips in rows wide enough apart to cultivate between them. The cultivator should be kept going at short intervals to destroy and prevent the growth of weeds and other vegetation. This cultivation improves the physical condition of the soil by fining it, extending the feeding area for roots and aids in the conservation of moisture. By this method the land will be returning a profit, and the soil will be prepared for the root crop to follow. With either method of preparation deep tillage in the autumn is advisable. As a general rule the ordinary plough should never go deeper than to turn over the surface, or dark coloured layer, which contains most of the humus or plant food. If deeper ploughing is done, and the raw subsoil brought to the surface, the soil will become less productive. It is, however, desirable to loosen the subsoil 8 or 10 inches deep, so that rain water will percolate into the subsoil, and thus increase the water-holding capacity, and allow the air free access into the soil to warm it, and produce the necessary conditions for the bacteria to act on the vegetable matter and make it available for plant food. Another benefit in loosening the subsoil is to allow the rootlets of deep rooted plants to penetrate and feed on the mineral matter contained in the subsoil.

Manuring.

Should you have any manure on hand in the autumn a light dressing, say 12 to 15 tons per acre, should be applied. For autumn ploughing I would advise ploughing a narrow furrow and setting it well up so that the manure will not be turned into the bottom of the furrow, but can be seen from the top and evenly distributed throughout. This, along with the good green clover sod that has been ploughed under, should be equal to about 22 to 25 tons of manure per acre. If no manure is on hand in the autumn I should advise a coating of green, or fresh, manure being applied during the winter. If possible draw direct from the stable to the field. Should there be no snow, or little snow, spread from the wagon or with the manure spreader; the latter is preferable, as it will do the work much more evenly than can be done by hand. Should

the snow be deep, or should there be any danger of washing away, put the manure in small piles about eight yards apart each way, and spread as soon as the snow is gone in springtime. It is essential to have the manure spread early so that it will get incorporated with the soil, and be turned under much more easily when ploughing.

The spring ploughing should be shallow, and as short a time as possible before the planting season. If the land has been ribbed or drilled in the autumn the ribs should be split with the same ploughs they were set up with, and a very fine tilth made before sowing.

Drilling or sowing on the flat.—Drilling is preferred, as it is very much easier to work the young plants when thinning, and better for the roots to have the soil slightly worked away instead of covering them. Make the drills 24 inches apart, then roll with the heavy land roller, thus flattening them down to about one-third of their original height. The field should then be in good condition for sowing.

VARIETIES.

Among the numerous varieties the following will be found to give good results:—

Mangels.—The Mammoth Long Red are types we recommend, as they have more feeding value and usually give heavier crops than the Tarkards or Globes. Sow 6 to 8 pounds of seed per acre.

Sugar mangels, White or Rosy. This is a new and distinct variety, being a cross between the mangel and sugar beet. It contains the rich quality of the sugar beet with the heavy production, size and keeping qualities of the mangel. The roots are clean, and leaves usually small, making them easily harvested. They are solid and rich in feeding value. Sow six to eight pounds of seed per acre.

Swedes. Prize Purple Top, Hail Westbury, Magnum Bonum, Kangaroo, Hartley's Bronze Top. All are excellent varieties. Sow three to four pounds of seed per acre.

Turnips, fall varieties.—Greystone, Imperial Green Globe, Purple Top Mammoth, Cow Horn and Red Top White Globe. Those varieties are not as good keepers and should be fed off in the early part of the season. Sow three to four pounds per acre.

Carrots.—Improved Short White, Mammoth, White Intermediate, Large White Vosges, Red Carrots, Guerande, Ox Heart or Early Gem. All are heavy croppers and have excellent feeding qualities. Sow $2\frac{1}{2}$ to $3\frac{1}{2}$ pounds of seed per acre. Less seed in all cases would do if all grew and produced strong healthy plants, but in order to have a perfect stand I should advise the amounts named. More failures in securing a good catch of roots are due to not sowing enough seed than to over-seeding or almost any other cause. It is much easier and cheaper to thin out the plants than to transplant them.

MACHINES FOR SOWING.

To the best of my knowledge there is no satisfactory horse-drawn seeding machine.

Very good results are obtained by the use of the hand machine made with cups inside the drum. The cups fill with seed as the machine revolves, and deposit the seed at the opening; while the smooth drum horse machine very often clogs, especially with the larger seeds, and thus causes blanks in the row. Manufacturers making the

horse machine should make it more like the hand machine. All that is required is to enlarge the seed boxes to about twice their present size, and to have a cup opposite each opening on the inside of the seed box so that it will fill each time the machine revolves, and place the seed in its proper place.

Cultivation.

Early cultivation of the young plants is very essential. Just as soon as the plants appear through the surface and the row can be followed begin cultivating. If the rows have all been sown exactly the same distance apart the single horse cultivator may be used. In order to arrange the horse cultivator to do the best work when the plants are small, place the wing mould-boards one on each side of the inside of the outside legs with the points upwards, as they cut much cleaner and do not disturb the plants as much as if the points were turned down. It may be necessary to remove some of the centre points when the plants are small. If the horse cultivator cannot be made to cut clean to within one inch of the plants, use the hand wheel hoe. This little machine may be arranged to cut within half an inch of the plants. If the land is free from stone, stubble, or litter, use the six-inch blades. If stony or lumpy use the two small ploughs, cutting quite close on each side of the row of plants. Early cultivation loosens the surface soil that has been packed by the roller and any crust formed by frequent showers, thus allowing the air to enter, warming the soil, retarding evaporation by making a dust blanket, destroying many small weeds, and forcing the growth of roots.

Thinning and Fœeing.

Mangels, sugar mangels, carrots or turnips.—Commence thinning when the plants are from one and a half to two inches high, leaving one good vigorous plant 10 to 12 inches apart in the row. Thinning is more economically done with the hoe than by hand, and a special hoe is necessary, which may be made from an ordinary weeding hoe with the neck straightened a little so that the hoe can be used to push or pull out the plants. The hoe should be cut to a length of 4 by 6 inches and have four square corners, and both ends and blade sharpened. Square corners are essential, as they help to separate the plants quickly. When thinning carrots a special hoe is necessary; in this case the blade should be 2½ inches wide, with square corners. A file should be carried so that the hoe can be kept sharp.

When thinning roots the operator should walk between the first and second rows from the one he is thinning, as the plants can be seen better from this distance than when walking directly over the row. No stooping or hand thinning is necessary, as the work can be done much more economically with the hoe. Roots should always be hoed at least once after thinning, whether there are weeds or not, as it pulverizes the soil between the plants with the usual benefits of cultivation. Cultivating should begin when the plants are quite small, and the cultivator should be kept going at short intervals until the leaves of the plant e covered the space between the rows.

Harvesting.

Mangels and sugar mangels growing, as they do, so much above ground, and being thus exposed, are more susceptible to frost than other roots. It is, therefore, necessary

to begin pulling about October 15. The date of pulling must be regulated according to locality. In some districts it may be necessary to pull a few days earlier and in other districts later. The roots should have as long a season of growth as possible, for the nearer the roots come to maturity the greater will be their feeding value, and they will keep better and later during winter. If pulled too early they are apt to become soft, and heat; and if frozen they will spoil in storage. The common practice, and the most advisable in taking up mangels and sugar mangels which grow well up out of the ground is to pull and top them by hand. Each root is pulled, with both hands, then all the tops are gathered together, and with a sudden jerk the tops are broken off. It is much better to break or twist the tops off by hand, for when topped with the knife they are more liable to decay. For convenience in loading into carts or wagons, throw four drills into one row; this is convenient for both pullers and loaders. If there is no danger of frost, allow the roots to remain on the ground twenty-four hours after being pulled and topped, as this will improve their keeping qualities by curing them, and any soil pulled will shake off much easier before reaching the root cellar. If there are any indications of frost, roots should be either housed or covered with leaves, as a few degrees of frost will injure mangels after they are pulled.

Should mangels get frost bitten, allow them to remain in the field to thaw out before handling them, as the least handling when frozen will break the skin and encourage rot. Sugar beets and carrots are more difficult to harvest owing to their long underground roots. It is best to run a subsoil plough or an ordinary plough without a mouldboard along one side of the row, loosening and cutting off some of the strong fibrous roots, and thus enable the puller to take up several roots at one time. They are usually pulled and laid in rows to be topped with the knife and thrown into baskets or boxes for convenience in loading. The time to harvest carrots and sugar beets in most districts is between October 20 and 30. Turnips being much hardier should be left in the ground longer, as a slight freezing will not injure them so long as they get thawed out before being housed or pitted.

Harvesting Turnips.

There are several ways which are quite successful. One of the easiest is to top them with the ordinary hoe, and turn the roots out with a sharp-shared plough with the mouldboard removed. By striking the tops of two rows together the turnips can be plainly seen, and if turned inwards on the row of tops they are clearly visible for loading into wagons or carts. Another plan is to top with the ordinary hoe and drag them out of the ground with the harrows by harrowing across the drills, letting the harrow lap if necessary. This method answers well in sandy soil, but in clay soil the turnips are considerably injured, and as a rule there is more earth clogging to the roots than is desirable. With this plan the tops have all to be removed before harrowing.

When help can be secured the old method of pulling and topping by hand, using a large heavy knife, is preferable. One stroke to cut the tap root, the second stroke to cut the top off, and by a slight swing while cutting the top four drills are thrown into one row for convenience in loading. Turnips should be left on the ground a day or two after being pulled, as they are not so easily injured by frost as other roots.

Drawing to the Cellar or Pit.

The ordinary low wagon will be found best, as it is advisable to run the roots over a slatted chute so as to sift out the earth. No tops should remain on the roots, as they will soon decay and injure the roots. Where the roots drop into the cellar they are liable to heat unless a ventilating shaft is first put in as close to the opening as possible and running from the bottom to the top of the root cellar. There are two important matters in connection with the successful storing of roots. The first is to keep them sufficiently cool, the second to prevent them from freezing. Heat will spoil them as quickly as frost.

Ventilation.

The principle of ventilating the root cellar is the same as that required to cause a draught in the stove. There should be shafts made down outside the wall to enter at the level of the floor below, with large openings directly through the roof. The outside doors and windows should be kept open every day until there is danger of frost. To keep out the frost have the root cellar at least two-thirds below the surface of the earth. Then about December 15 it may be necessary to bank up to the roof with stable manure. Where there is no root cellar, or insufficient room, roots may be pitted successfully. Select a high, dry spot convenient to the buildings. Mark out a pit the required length and about five feet wide, and excavate two or three feet deep, but if there is danger of water, excavate only three or four inches. The earth should be laid along the sides for covering. Build the roots up to a point three or four feet high, then cover with straw about four inches and with earth about eight inches. This covering may be sufficient until about the middle of November. Then cover with four to six inches of stable manure and twelve inches of earth. To make provision against excessive frost it is now advisable to cover the pit the last of December with long stable manure. To ventilate the pit, take two boards one inch by six inches and eight feet long, nail good strong strips of wood crosswise up three feet, the other five feet to be boarded solid, leaving the top open until severe frost comes. Then put a bunch of straw in to keep the frost out. These shafts should be in every eight or ten feet apart along the pit, the slat work to extend through the roots to the bottom of the pit. It is desirable to keep an even temperature in the pit. To ascertain the temperature an extra shaft may be put in to allow a thermometer to be raised and lowered, and temperature noted, as heat and frost have to be guarded against.

The greatest success in growing roots will be obtained when the following are observed:—

Systematic rotation of crops.

Roots to follow a fresh clover sod.

Manure once in the rotation.

Thorough cultivation in preparation for the crop, and after the roots are sown.